Can inhalation of even one particle of plutonium result in cancer in humans?

Research has shown that a person would have to inhale large amounts of plutonium-contaminated dust particles to have a significant radiation exposure. One study concludes that, “Based on our calculations, millions of dust particles contaminated with PuO_2 (plutonium oxide) must be inhaled in order for significant radiation doses to be delivered to key body organs/tissues (bone surface, red marrow, lung, liver)”. (Scott, B.R., et al, 1999, *Recommendations for improving the interim radionuclide soil action levels for the Rocky Flats Cleanup Agreement*, Lovelace Respiratory Research Institute.) This conclusion is based on several multiple-particle intake distributions generated for PuO_2 from re-suspended soil deposited in the respiratory tract. The mean intake of plutonium resulting from inhaling a certain number of contaminated dust particles from soils with a specific activity can be derived from these distributions. As an example, if someone breathed in a million dust particles from soil contaminated with plutonium at an activity level of 6.5 pCi/g (highest level measured off-site), the average intake is predicted to be only about 2.4×10^{-4} pCi (0.00024 pCi/g).

These distributions demonstrate that although it may be possible for smaller numbers of plutonium particles to induce cancer in some individuals, it is highly unlikely. So in theory, a single exposure could initiate the chain of events which lead to cancer, but exposures that induce cancer risks below one in a million are considered to be negligible.